A new species of the *Hipposideros bicolor* group (Chiroptera: Hipposideridae) from Thailand

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While Curator of Terrestrial Vertebrates at the Thai National Reference Collection (now a part of the Thailand Institute of Scientific and Technological Research) the late Kitti Thonglongya undertook a survey of the bats of Thailand and their associated parasites, collecting extensively throughout the country. For the most part the bats that he collected were reported on the basis of a broad sample by Hill (1975). Those sent to London for examination included an example of *Hipposideros* from Rat Buri (TNRC 54-2080, now BM(NH) 78.2344) initially referred to *H. ater* Templeton, 1848 but which proved to differ quite clearly either from this species or from *H. cineraceus* Blyth, 1853 which in some superficial respects it resembled. No further study was undertaken at the time, Hill (1975) listing it as *Hipposideros* sp. but noting that it could not be referred to *ater* or to *cineraceus* from which it differed in certain features of the noseleaf and skull, or in size. Further similar specimens have now been found in the Thai National Reference Collection and more detailed study has established that all represent an undescribed species: additionally, another example in London (BM(NH) 78.2346, formerly TNRC 54–1961) proves also to represent the new species, rather than *H. cineraceus* as was thought originally.

Hipposideros halophyllus sp. nov

Hipposideros sp.: Hill, 1975: 27, Rat Buri, Thailand.
Hipposideros cineraceus: Hill, 1975: 29 (in part), Phet Buri, Thailand; Lekagul & McNeely, 1977: 165 (in part), fig. 61.

HOLOTYPE. ♂ TNRC 54–3694. Khao Sa Moa Khon, Tha Woong, Lop Buri, Thailand. Collected by Kitti Thonglongya. In alcohol, skull extracted, rear of cranium slightly damaged.

OTHER MATERIAL EXAMINED IN LONDON. ♂♂, ♀ TNRC 54–3696, 54–3697, 54–3705. All from the type locality. In alcohol, skulls extracted.

♂ BM(NH) 78.2344. Tham Khao Bin, Rat Buri, Thailand. Originally TNRC 54–2080. In alcohol, skull extracted.

♂ BM(NH) 78.2346. Tham Khao Yoi, Phet Buri, Thailand. Originally TNRC 54–1961. Skin and skull.

OTHER MATERIAL EXAMINED IN BANGKOK. ♂♂ TNRC 54–3695, 54–3706, ♀♀ TNRC 54–3704, 54–3710. All from the type locality. In alcohol, skulls of TNRC 54–3695, 54–3710 extracted.

DIAGNOSIS. A member of the *bicolor* group (Hill, 1963) of *Hipposideros*, characterized externally by large rounded ears lacking any sharply defined point or any definite fold or thickening at the antitragal lobe; by the absence of lateral supplementary leaflets beneath the antero-lateral margin of the anterior leaf, which has a shallow median emargination, and by the expansion of the internarial septum to form a small, disc-like structure just anterior

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to the nostrils. The skull is elongate and narrow, the zygomatic width less than the mastoid width, the braincase moderately inflated anteriorly, with a low, narrow rostrum, broad basisphenoid depression and wide basioccipital, the tympanic bullae long and narrow and the inflated part of the cochleae elongate rather than subcircular. The new species is similar in size and ear structure to *Hipposideros cineraceus* or to *H. ater* but may be distinguished by its internarial structure and elongate tympanic bullae. Among other Asian species it has some resemblance to *H. ridleyi* in the disc-like expansion of the internarial septum but *ridleyi* is much larger (length of forearm c. 48 mm) and its internarial disc is relatively much larger, thinner and more saucer-like.

DESCRIPTION. Small (length of forearm 35·1–38·2 mm). Ears large, broad and rounded with broad, poorly defined tip, the anterior margin strongly convex, lacking any basal lobe, the posterior margin of the ear slightly convex for much of its length, deflected sharply to a wide, anteriorly rectangular antitragal lobe; a very slight thickening of the integument of the ear at the rear of the antitragal lobe but no definite fold or obvious antitragal modification. Outer (medial) surface of conch haired for about one half or a little more the length of the ear, the hairs proximally rather dense and long, more distally sparser and shorter; a sparse scattering of short hairs along the anterior border of the inner surface of the conch.

Muzzle low, not especially broadened, with small, narrow noseleaf lacking lateral supplementary leaflets; anterior leaf narrow, rather elongate, its total width about two thirds of the width of the muzzle, widest at a point level with the nostrils, narrowed anteriorly with a small, rounded median emargination. Central part of internarial septum expanded into a small, rounded, lobular and thickened disc-like structure lying in the narial depression slightly anteriorly to the nostrils: laterally this disc is slightly swollen, with a shallow median trough separating its lateral lobes; anteriorly the margins of the expansion curve sharply inwards to join the anterior leaf by a short, constricted and unthickened internarial segment, posteriorly merging similarly but less abruptly with the base of the intermediate leaf. Narial lappets small but evident, the nostrils very slightly pocketed. Intermediate leaf sometimes with four small glands, not sharply demarcated from anterior leaf and not especially elevated or inflated. Posterior leaf high, slightly semicircular, its lower half or a little more divided by three broad, ill-defined septa into four shallow pockets, its upper part smooth; no serrated structure on its posterior face. A prominent frontal sac with horizontal aperture lies immediately behind the posterior leaf in male examples, represented in a female specimen by a small tuft of hair.

All but one of the specimens available in London are in alcohol and have been so for some years: the sole dry example also appears to have been preserved in this way, possibly for a considerable period. The dorsal surface is now mid-brown, the hairs pale cream at the base and generously tipped with the brown terminal colour, which doubtless has been bleached to some extent by fluid preservation; the ventral surface is paler, largely lacking any brown, and has a greyish or greyish buff tinge.

Skull very small (condylocanine length 12·7–13·1 mm) with inflated, elongate and rather narrow braincase, its length from occiput to narrowest part of postorbital constriction one fifth greater than its greatest width across the mastoids. Postorbital region strongly constricted, the rostrum narrow and uninflated, its greatest supraorbital width about two fifths of the mastoid width; anterior and lateral rostral compartments not much inflated, the anterior part of the rostrum in profile a little below rather than level with the junction of the sagittal and supraorbital crests, the upper profile of the rostrum sloping slightly downward anteriorly rather than horizontal, and curving smoothly rather than abruptly to the maxillae. Zygomata robust, with a low jugal eminence; anteorbital foramen elongate, closed by a narrow bar of bone. Premaxillae making a broadly V-shaped junction with the maxillae; palate long, narrow, the toothrows strongly convergent anteriorly; palation rounded, level anteriorly with a line joining the anterior faces of m^{3-3}. Mesopterygoid fossa wide, the pterygoids slightly flared; sphenoidal bridge moderate, flanked by elongate apertures; basisphenoidal depression wide and shallow, subcircular in outline; basioccipital wide, the cochleae widely separated. Tympanic bullae long, narrow, almost platelet-like, anteriorly approaching the rear of the glenoid fossa, in length considerably exceeding the antero-posterior diameter of the exposed part of the associated cochleae, while in width the tympanic bullae are equal to rather less than one half the diameter of the exposed part of the associated cochleae along the other axis; cochleae small, not much inflated, their greatest exposed width about one and three quarter times their distance apart, the exposed part more elliptical rather than subcircular in outline.

Dentition with no unusual features; upper incisors weak, their tips convergent, the outer lobe obsolescent; anterior upper premolar (pm^2) small, compressed between the canine and the second upper premolar (pm^4) or very slightly extruded but nonetheless separating these teeth; posterior ridge of last upper molar one half of the length of its anterior ridge; outer lower incisors rather larger in crown area than inner lower incisors; anterior lower premolar (pm$_2$) about equal in length to second lower premolar (pm$_4$) and one half to three quarters its height.

Measurements of the holotype, followed by minima and maxima of the series of six (except where indicated in parentheses) measured in London: length of forearm 37·1, 35·1–38·2; condylocanine length 12·7, 12·7–13·1 (5); least interorbital width 2·0, 2·0–2·1; rostral width 3·6, 3·6–3·7; width across anteorbital foramina, 3·6, 3·5–3·7; zygomatic width 7·4, 7·2–7·4; width of braincase 6·9, 6·5–6·9 (5); mastoid width 7·8, 7·6–7·9, c^1–c^1 (alveoli) 3·1, 3·0–3·3; m^3–m^3 4·8, 4·8–4·9; width sphenoidal depression 2·7, 2·6–2·8 (5); width basioccipital 2·68, 2·62–2·77; c–m^3 4·8, 4·7–4·8; length complete mandible from condyles 8·5, 8·2–8·6 (5); length right ramus from condyle 8·9, 8·9–9·2 (4); c–m$_3$ 5·1, 5·0–5·2; length tympanic bulla 2·57, 2·49–2·72, width tympanic bulla 1·08, 0·98–1·13; antero-posterior diameter of cochlea 2·01, 1·80–2·03; transverse diameter of exposed part of cochlea 2·23, 2·21–2·33.

ETYMOLOGY. The name of the new species is drawn from αλως, a disc, and φύλλον, a leaf.

REMARKS. The noseleaf of this new species is described (p. 165) and illustrated (fig. 61) by Lekagul & McNeely (1977) as *Hipposideros cineraceus.* The illustration of the skull (p. 166) of *H. cineraceus* provided by these authors is in fact of that species, having in contrast to the skull of *H. halophyllus* an inflated, higher rostrum, broad, short tympanic bullae and rounded rather than elongate cochleae. The material of *H. halophyllus* examined in London has come from the Thai National Reference Collection: all but one of these specimens was identified initially as *H. cineraceus* in Thailand, the exception being referred formerly to *H. ater.* Evidently Lekagul & McNeely employed a specimen labelled *H. cineraceus* from this collection as the basis of their description and illustration of the noseleaf.

The new species is similar in size to *Hipposideros cineraceus* and a little smaller than *H. ater,* with either of which it can at first inspection be confused. Its ears are similar in size and shape to those of *cineraceus* but in this species there is a distinct fold or thickening at the antitragal lobe. There is also a slight thickening with a small antitragal fold in the ear of *H. ater*. The anterior leaf in *H. halophyllus* is shallowly but distinctly emarginated just above the centre of the upper lip: neither *cineraceus* nor *ater* display any such emargination and although in both of these the internarial septum is inflated and sometimes bulbous there is no evidence of the development of any disc-like structure between and slightly in advance of the nostrils, the septum remaining more or less parallel-sided although swollen. Cranially, *halophyllus* may be distinguished from *cineraceus* and *ater* by its less inflated anterior narial compartments and lower anterior rostrum which slopes more gently to the canines, by its narrower, longer tympanic bullae, its more elongate rather than subcircular cochleae, and by its broader basioccipital.

DISCUSSION. Modification of the internarial septum into a circular or subcircular disc in *Hipposideros* occurs in the three African species *H. curtus* Allen, 1921, *H. jonesi* Hayman, 1947 and *H. marisae* Aellen, 1954, and also in one other Asian species, *H. ridleyi* Robinson & Kloss, 1911 from Malaya and Borneo. All belong to the *bicolor* group of *Hipposideros* and except for *curtus* are allocated by Hill (1963) to the *bicolor* subgroup, characterized by

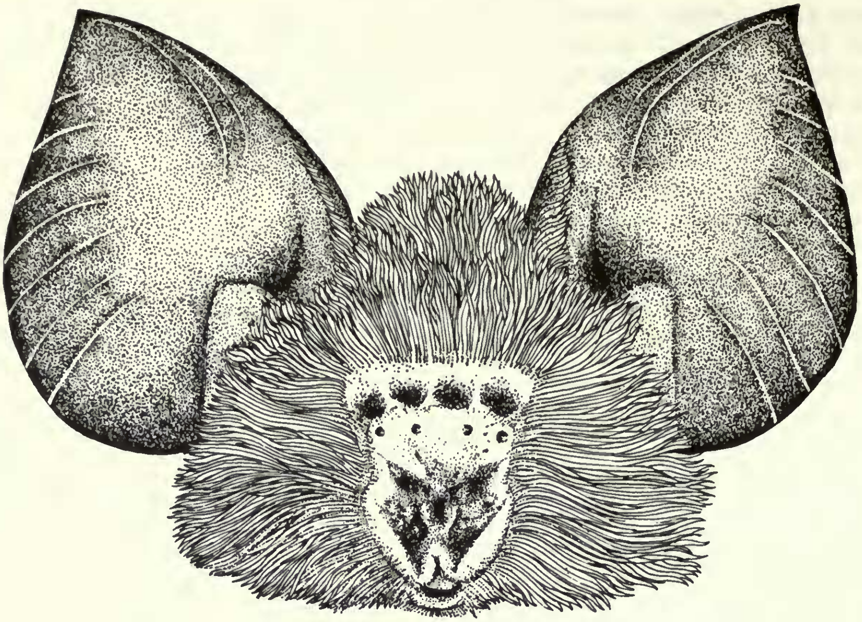

Fig. 1. *Hipposideros halophyllus.* ♀ TNRC 54–3704. Head × 5

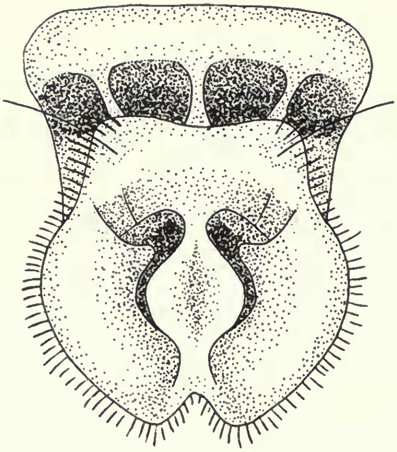

Fig. 2 *Hipposideros halophyllus.* ♂ BM(NH) 78.2344. Noseleaf × 10

broad, rounded ears with an internal fold or thickening at the antitragal lobe and haired for one half or less of their length, by the absence of lateral supplementary leaflets or by the presence of no more than a single small leaflet, and by an elongate and narrow skull with an inflated braincase, the zygomatic width rarely exceeding the mastoid width. Although in *curtus* the ears are broad, rounded and haired for only one half of their length, this species has two supplementary leaflets and cranially approaches the *galeritus* subgroup to which Hill (1963) allocated it. The members of this subgroup are more usually characterized by their generally more triangular ears which often have a concavity in the posterior margin just below the tip, a less prominent antitragal fold and are pilose externally for about two

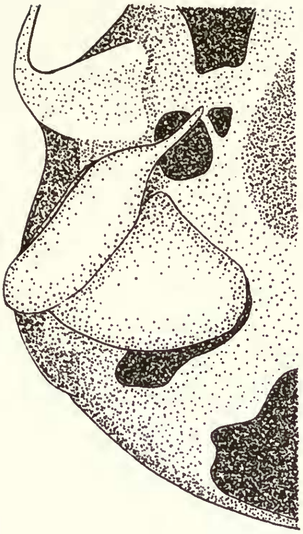

Fig. 3 *Hipposideros halophyllus.* ♂ BM(NH) 78.2346. Auditory region of skull × 10

thirds of their length, by the presence of two or three supplementary leaflets, and by a shorter, broader skull.

In size *Hipposideros halophyllus* is similar to *marisae* but the ears of this species although having little or no antitragal folding or swelling are rather more triangular in outline, like those of *jonesi* or *ridleyi*, and have a more clearly defined tip. There is one small lateral supplementary leaflet in *marisae*: *ridleyi* like *halophyllus* effectively lacks supplementary leaflets while in *curtus* the single leaflet extends forward beneath the anterior leaf to the median line. The internarial structure of *halophyllus* resembles that of *marisae* or *curtus*: in all the disc-like expansion is more or less lobulated, in *curtus* extending a little further posteriorly between the nostrils which however it does not greatly conceal. The internarial expansion in these species differs quite markedly from the circular internarial disc found in *jonesi* and *ridleyi* which is relatively larger, flatter, thinner and more saucer-like and which at least to some extent conceals the nostrils. The structure of the posterior leaf in *halophyllus* also resembles that of *marisae* or *curtus* but the septa supporting its lower part are broader and less well defined and the pockets that they delimit are shallower. In *jonesi* and *ridleyi* the posterior leaf is very high and it is clearly demarcated into four deep pockets in its lower part. Although in ear and noseleaf structure *halophyllus* has a number of features in common with *marisae,* the rostrum of the latter is not especially low, its tympanic bullae are not narrow and elongate and its cochleae are rounded: they are, however, separated by a wide basioccipital as in *halophyllus.*

Affinities and relationships in the *bicolor* group of *Hipposideros* were discussed in some detail by Hill (1963) who pointed out that a number of its species linked the two loosely defined subgroups into which he divided it. Among these *Hipposideros marisae* has features that are chiefly those of the *bicolor* subgroup but has ears that tend towards the *galeritus* subgroup, while *curtus* to some extent displays the opposite combination. It is also interesting that similar, indeed parallel developments in the structure of the internarial septum have occurred in the group in both Asia and Africa. In both regions the group has produced species (*halophyllus, marisae, curtus*) with a swollen, more or less disc-like structure closely associated with the nostrils. At the same time, each region has a further species (*ridleyi, jonesi*) with this expansion apparently carried further to produce a larger, thinner disc that covers much of the narial depression and partially obscures the nostrils, which are deeply pocketed.

Acknowledgements

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